UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
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BIN C15700
Seattle, WA 98115-0070

April 11, 2003

Thomas F. Mueller
Chief Regulatory Branch
Department of the Army
Seattle District Corps of Engineers
Post Office Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Chelan Public Utility District (PUD) Fish Study Docks at Wells Dam and Rock Island Dam, Chelan County, Washington. (NOAA Fisheries No. 2002/01400) (COE No. 2002-2-00675 and 2002-2-00353) (WRIAs 40 and 47)

Dear Mr. Mueller:

In accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended, 16USC 1531, *et seq*. and the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, the attached document transmits the NOAA's National Marine Fisheries Service (NOAA Fisheries) Biological Opinion (Opinion) and MSA consultation on the proposed Chelan PUD Fish Study Docks at Wells Dam and Rock Island Dam in Chelan County, Washington.

The U.S. Army Corps of Engineers (COE) has determined that the proposed action was likely to adversely affect Upper Columbia River spring-run chinook (*Oncorhynchus tshawytscha*) and Upper Columbia River steelhead (*O. mykiss*) Evolutionary Significant Units. Formal consultation was initiated on January 15, 2003.

This Opinion reflects formal consultation and an analysis of effects covering the above listed species in the Columbia River above Wanapum Dam and below Wells Dam, Washington. The Opinion is based on information provided in the biological assessment received by NOAA Fisheries on November 7, 2002, subsequent information transmitted by telephone conversations, fax, and electronic mail. A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office.

NOAA Fisheries concludes that the implementation of the proposed project is not likely to jeopardize the continued existence of the above listed species. Please note that the incidental take statement, which includes reasonable and prudent measures and terms and conditions, was designed to minimize take.

The MSA consultation concluded that the proposed project may adversely impact designated Essential Fish Habitat (EFH) for chinook and coho (*O. kisutch*) salmon. Specific Reasonable and Prudent Measures of the ESA consultation, and Terms and Conditions identified therein, would address the negative effects resulting from the proposed COE actions. Therefore, NOAA Fisheries recommends that they be adopted as EFH conservation measures.

If you have any questions, please contact Justin Yeager of the Washington State Habitat Branch Office at (509) 925-2618 or email at justin.yeager@noaa.gov.

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

Endangered Species Act - Section 7 Consultation

Biological Opinion

and

Magnuson-Stevens Fishery Conservation and Management Act

Essential Fish Habitat Consultation

Chelan PUD Fish Study Docks Near Wells Dam and Rock Island Dam, Chelan County, Washington

NOAA Fisheries No. 2002/01400

Agency: U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service
Northwest Region, Washington Habitat Branch

Issued by: For Michael R Crouse Date Issued: April 11, 2003

D. Robert Lohn
Regional Administrator

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1.0 INTRODUCTION

This document is the product of an Endangered Species Act (ESA) section 7 formal consultation and Magnuson-Stevens Fishery Conservation and Management Act (MSA) Essential Fish Habitat (EFH) consultation between the NOAA's National Marine Fisheries Service (NOAA Fisheries) and the U.S. Army Corps of Engineers (COE) for the proposed fish study dock projects near Wells Dam (COE No. 2002-2-00675) and Rock Island Dam (COE No. 2002-2-00353) in Chelan County, Washington. The proposed action would occur within the geographic boundaries and habitats of two Evolutionarily Significant Units (ESU[1]) and the ESA listed salmon and steelhead therein, including endangered Upper Columbia River spring-run (UCRS) chinook (*Oncorhynchus tshawytscha*) and endangered Upper Columbia River (UCR) steelhead (*O. mykiss*). In addition, the action area is designated as Essential Fish Habitat (EFH) for chinook (*O. tshawytscha*) and coho (*O. kisutch*) salmon.

The purpose of this document is to present NOAA Fisheries Biological Opinion (Opinion) on whether the proposed action is likely to jeopardize the continued existence of the UCRS chinook and/or UCR steelhead ESUs listed under the ESA. Further, this document will determine if the proposed action will adversely affect designated coho and chinook salmon EFH. These ESA and EFH determinations will be reached by analyzing the biological effects of construction activities related to the fish study dock projects near Wells Dam and Rock Island Dam, relating those effects to the biological and ecological needs of listed species, and then adding these effects to the environmental baseline of the action area.

1.1 Background and Consultation History

The COE is proposing to permit the construction of two docks in the Columbia River to facilitate various fish survival studies at two hydroelectric facilities. One dock will be installed just below Wells Dam, at river mile 515 on the west side of the Columbia River, located at NW 1/4 Section 7, Township 28N, Range 24E. The second dock will be installed just below Rock Island Dam, at river mile 453 on the west side of the Columbia River, located at NE 1/4 Section 5, Township 21N, Range 22E.

On November 7, 2002, NOAA Fisheries received a request from the COE for ESA section 7 formal consultation and EFH consultation to permit the construction of two fish study docks below Wells Dam and Rock Island Dam. NOAA Fisheries worked with the COE and the Chelan Public Utility District (PUD) to gather additional project information, and formal ESA and EFH consultation was initiated on January 15, 2003. This combined ESA and EFH consultation is based on the information presented in the Biological Evaluation (BE) and EFH assessment received November 7, 2002, electronic mail correspondence, faxes, and phone conversations.

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[1] "ESU" means a population or group of populations that is considered distinct (and hence a "species") for purposes of conservation under the ESA. To qualify as an ESU, a population must (1) be reproductively isolated from other conspecific populations, and (2) represent an important component in the evolutionary legacy of the biological species (Waples *et al.* 1991).

1.2 Description of the Proposed Action

The projects at Wells Dam and Rock Island Dam each include construction of a concrete pad, an abutment, two plinths, a gangway, and a float. The purpose of the project is to allow the Chelan PUD to conduct Habitat Conservation Plan (HCP) related fish tagging studies that would provide the PUD and other agencies with information regarding fish survival through the area. In addition, the PUD proposes to minimize impacts resulting from construction by planting riparian vegetation at two sites covering approximately 1,200 square feet.

1.2.1 Dock Construction

Plinths and Abutments

Two plinths would be constructed to provide support for each float. The construction of each would consist of digging a hole measuring 128 cubic feet and filling it with concrete to form a base for the plinths. The vertical portion would be approximately 5 cubic feet and stand 2.5 feet high constructed out of formed concrete. Equipment used would include a backhoe and cement truck. The plinths would be installed entirely in the dry during low water. In addition, there would be a 256 cubic foot concrete abutment to support the gangway and a 187 cubic foot concrete pad. The total structure waterward of the ordinary high water line (OHWL) for the plinths, abutments, and concrete pad would be 521 cubic feet and the total structure above the OHWL would be 1,261 cubic feet. The total in-water structure of the plinths and abutments would be 43 cubic feet.

Floats and Gangways

Each float would be 12 feet by 40 feet (480 square feet), constructed with an aluminum frame and grating. The floats would have at least 66% of the surface area grated to achieve a minimum of 60% total light permeable surface. The gangways would be 75 feet by 5 feet (375 square feet) with only a portion of the gangways waterward of the OHWL. The floats and gangways would be shop fabricated and installed with a truck crane, working from the concrete pad. Each float would be anchored to the shore via the gangway, two cables, and a stiff-arm assembly extending from the plinths. The total amount of overwater structure waterward of the OHWL for both docks would be 1,535 square feet.

1.2.2 Riparian Planting Mitigation

The Chelan PUD is also proposing to restore two patches (1,200 square feet) of riparian area. The planting would consist of native shrubs (sitka willow (*Salix sitchensis*), scouler willow (*S. scouleriana*), sandbar willow (*S. exigua*), Mackenzie's willow (*S. prolixa*), Pacific willow (*S. lasiandra*), red osier dogwood (*Cornus stolonifera*)) and trees (black cottonwood (*Populus trichocarpa*)). The Chelan PUD would monitor the plantings for five years and ensure a minimum of 80% survival.

1.2.3 Conservation Measures

The proposed action includes the following measures. These measures will minimize or avoid effects of the action as discussed in section 2.1.3.

1. All heavy equipment would be clean and free of external oil, fuel, or other potential pollutants.
2. A spill prevention, control, and containment (SPCC) plan would be implemented (if heavy equipment will be used).
3. Minimal riparian vegetation would be removed or destroyed during dock installation.
4. Installation and construction of permanent dock components would take place between November 15 to March 31 to minimize contact with migrating and rearing salmonids.
5. Float materials would allow 60% light penetration (only 40% of the float surface creates shade, or translucent materials only prevent 40% of light from passing though).
6. Float materials contacting the water would be light grey or white in color.
7. No skirting would be placed on the floats.
8. The docks would be built with materials that do not leach preservatives or other compounds that are known to be deleterious to fish.
9. Walkways and gangways would be fully grated.
10. Non-floating portions of the dock would be elevated at least two feet above the water.
11. No existing habitat features would be removed from the shore or aquatic environment (woody debris or substrate).
12. Docks would be cleaned to ensure light penetration.
13. No shoreline armoring (*e.g.*, bulkheads, rip rap, and retaining walls) would occur in association with the dock installation (before, during, or after installation of the dock).
14. Upon completion of the survival study, the Chelan PUD would remove the float and walkway/gangway.
15. Each year, upon completion of the tagging studies, the floats would be removed (generally from September to March).

16. No float or gangway would be anchored to the bed of the reservoir.

1.3 Description of the Action Area

Under the ESA, the "action area" is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this consultation the action area includes Lake Entiat/Rocky Reach Dam reservoir from Rocky Reach Dam at river mile 473.7 to Wells Dam at river mile 515.8 of the Columbia River, and Lake Wanapum/Wanapum Dam reservoir from Wanapum Dam at river mile 415.8 to Rock Island Dam at river mile 453.4 of the Columbia River. Although most effects of the action will be localized, increases in predator population have the potential to affect listed salmonids throughout the reservoirs.

2.0 ENDANGERED SPECIES ACT

2.1 Biological Opinion

The objective of this Opinion is to determine whether the proposed project is likely to jeopardize the continued existence of the UCRS chinook and/or UCR steelhead ESUs.

2.1.1 Status of Species

The listing status and biological information for NOAA Fisheries listed species that are the subject of this consultation are described below in Table 1.

Species	Listing Status	Critical Habitat	Protective Regulations	Biological Information
Upper Columbia River spring-run chinook salmon	March 24, 1999; 64 FR 14308, Endangered	Not Designated[2]	July 10, 2000; 65 FR 42422	Myers *et al*. 1998; Healey 1991
Upper Columbia River steelhead	August 18, 1997; 62 FR 43937, Endangered	Not Designated	July 10, 2000; 65 FR 42422	Busby *et al.* 1995; 1996

Table 1. References for Additional Background on Listing Status, Biological Information, and Critical Habitat Elements for the Listed Species Addressed in this Opinion.

Throughout the Columbia Basin, salmonids have been negatively affected by a combination of habitat alteration and hatchery management practices. Mainstem dams on the Columbia River,

[2]Under development. On April 30, 2002, the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 Critical Habitat designation for this and 18 other ESUs.

are perhaps the most significant source of habitat degradation for the ESUs addressed under this consultation. The dams act as a partial barrier to passage, kill out-migrating smolts in their turbines, raise temperatures throughout the river system, and have created lentic refugia for salmonid predators. In addition to dams, irrigation systems have had a major negative impact by diverting large quantities of water, stranding fish, acting as barriers to passage, and returning effluents containing chemicals and fine sediments. Other major habitat degradation has occurred through urbanization and livestock grazing practices (WDFW *et al.* 1993; Busby *et al*. 1996; NMFS 1996a; 1998; 2000; 64 FR 14308, April 22, 1992; 62 FR 43937, August 18, 1997).

Habitat alterations and differential habitat availability (*e.g.*, fluctuating discharge levels) impose an upper limit on the production of naturally spawning populations of salmon and steelhead. The National Research Council Committee on Protection and Management of Pacific Northwest Anadromous Salmonids identified habitat problems as a primary cause of declines in wild salmon runs (NRCC 1996). Some of the habitat impacts identified were the fragmentation and loss of available spawning and rearing habitat, migration delays, degradation of water quality, removal of riparian vegetation, decline of habitat complexity, alteration of stream flows and streambank and channel morphology, alteration of ambient stream water temperatures, sedimentation, and loss of spawning gravel, pool habitat, and large woody debris (LWD) (NMFS 1996a; 1998; NRCC 1996; Bishop and Morgan 1996).

Hatchery management practices are suspected to be a major factor in the decline of these ESUs. The genetic contribution of non-indigenous, hatchery stocks may have reduced the fitness of the locally adapted native fish through hybridization and associated reductions in genetic variation or introduction of deleterious (non-adapted) genes. Hatchery fish can also directly displace natural spawning populations, compete for food resources, or engage in agonistic interactions (Campton and Johnston 1985; Waples *et al.* 1991; Hilborn 1992; NMFS 1996a; 63 FR 11798, March 10, 1998).

The following information summarizes the status of Columbia River salmonids by ESU that are the subjects of this consultation. Most of this narrative was largely taken from the Opinion on Reinitiation of Consultation on Operation of the Federal Columbia River Power System (FCRPS), including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin (NMFS 2000).

2.1.1.1 Upper Columbia River Spring Chinook

The UCRS chinook salmon ESU, listed as endangered on March 24, 1999 (64 FR 14308), includes all natural-origin, stream-type chinook salmon from river reaches above Rock Island Dam and downstream of Chief Joseph Dam, including the Wenatchee, Entiat, and Methow River basins. All chinook in the Okanogan River are apparently ocean-type and are considered part of the UCR summer- and fall-run ESU. The spring-run components of the following hatchery stocks are also listed: Chiwawa, Methow, Twisp, Chewuch, and White rivers and Nason Creek. Critical Habitat is not currently designated for UCRS chinook, although a designation is forthcoming (see footnote 2).

The populations are genetically and ecologically separate from the summer- and fall-run populations in the lower parts of many of the same river systems (Myers *et al*. 1998). Although fish in this ESU are genetically similar to spring chinook in adjacent ESUs (*i.e.*, mid-Columbia and Snake), they are distinguished by ecological differences in spawning and rearing habitat preferences. For example, spring-run chinook in upper Columbia tributaries spawn at lower elevations (500 to 1,000 meters) than in the Snake and John Day River systems.

The upper Columbia River populations were intermixed during the Grand Coulee Fish Maintenance Project (1939 through 1943), resulting in a loss of genetic diversity between populations in the ESU. Homogenization remains an important feature of the ESU. Fish abundance has trended downward both recently and over the long term. At least six former populations from this ESU are now extinct, and nearly all extant populations have experienced escapements of fewer than 100 wild spawners in recent years. UCRS chinook occur within the action area only during their smolt and adult migrations.

2.1.1.2 Upper Columbia River Steelhead

The UCR steelhead ESU, listed as endangered on August 18, 1997 (62 FR 43937), includes all natural-origin populations of steelhead in the Columbia River basin upstream from the Yakima River in Washington, to the U.S./Canada border. The Wells Hatchery stock is included among the listed populations. Critical Habitat is not presently designated for UCR steelhead, although a designation is forthcoming (see footnote 2).

Estimates of historical (pre-1960s) abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size exceeding 5,000 adults for tributaries above Rock Island Dam (Chapman *et al*. 1994). Runs may, however, already have been depressed by lower Columbia River fisheries. UCR steelhead occur within the action area only during their smolt and adult migrations.

2.1.2 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR part 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species. This analysis involves the initial steps of (1) defining the biological requirements of the listed species and (2) evaluating the relevance of the environmental baseline to the species' current status.

From that, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries considers estimated levels of mortality attributed to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmonid's life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

2.1.2.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution, and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its original decision to list the species for protection under the ESA. In addition, the assessment will consider any new information or data that are relevant to the determination.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which time protection under the ESA would be unnecessary. Species or ESUs not requiring ESA protection have the following attributes: population sizes large enough to maintain genetic diversity and heterogeneity, the ability to adapt to and survive environmental variation, and are self-sustaining in the natural environment.

UCRS chinook and UCR steelhead share similar basic biological requirements. These requirements include food, flowing water (quantity), high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content), clean spawning substrate, and unimpeded migratory access to and from spawning and rearing areas (adapted from Spence *et al.* 1996). The specific biological requirements affected by the proposed action include water quality, food, and unimpeded migratory access.

2.1.2.2 Environmental Baseline

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process" (50 CFR 402.02).

The most recent evaluation of the environmental baseline for the Columbia River is part of the NOAA Fisheries' Opinion for the FCRPS issued in December 2000. That Opinion assessed the entire Columbia River system below Chief Joseph Dam, and downstream to the farthest point (the Columbia River estuary and nearshore ocean environment) at which ESA-listed salmonids are influenced. A detailed evaluation of the environmental baseline of the Columbia River basin can be found in the FCRPS Opinion (NMFS 2000).

The quality and quantity of freshwater habitats in much of the Columbia River basin have declined dramatically in the last 150 years. Forestry, farming, grazing, road construction, hydrosystem development, mining, and urbanization have radically changed the historical habitat conditions of the basin. Depending on the species, they spend from a few days to one or two years in the Columbia River and its estuary before migrating out to the ocean, and another one to four years in the ocean before returning as adults to spawn in their natal streams.

Water quality in streams throughout the Columbia River basin has been degraded by dams and diversion structures, water withdrawals, farming and grazing, road construction, timber harvest activities, mining activities, and urbanization. Tributary water quality problems contribute to poor water quality where sediment and contaminants from these tributaries settle in mainstem reaches and the estuary. Temperature alterations also affect salmonid metabolism, growth rate, and disease resistance, as well as the timing of adult migrations, fry emergence, and smoltification. Many factors can cause high stream temperatures, but they are primarily related to land-use practices rather than point-source discharges. Loss of wetlands and increases in groundwater withdrawals have contributed to lower base stream flows, which in turn contribute to temperature increases. Channel widening and land use practices create shallower streams causing temperature increases.

Pollutants also degrade water quality. Salmon require clean gravel for successful spawning, egg incubation, and emergence of fry. Fine sediments clog the spaces between gravel and restrict the flow of oxygen-rich water to the incubating eggs. Excess nutrients, low levels of dissolved oxygen, heavy metals, and changes in pH also directly affect the water quality for salmon and steelhead.

Water quantity problems are also a significant cause of habitat degradation and reduced fish production. Withdrawing water for irrigation, urban, and other uses can increase temperatures, smolt travel time, and sedimentation. Return water from irrigated fields can introduce nutrients and pesticides into streams and rivers. On a larger landscape scale, human activities have affected the timing and amount of peak water runoff from rain and snowmelt. Many riparian areas, floodplains, and wetlands that once stored water during periods of high runoff have been developed.

At the project sites, roads, power lines, and agricultural activities have had some affect on the local habitat. Maintenance of power lines and roads continues, but are not expected to be expanded or use substantially increased. Agricultural activities can have some affects on riparian composition and chemical contamination. The composition of riparian vegetation towards a more homogeneous stand can alter the microclimate of the immediate areas, such as shading and litter fall. Chemical contamination can also affect salmonids by affecting water quality and/or contributing a host of sublethal affects that can alter their behavior.

At the project site scale, both locations are sparsely vegetated with bitter brush, rabbit brush, and sage brush. The average height of the shrubs is around 3 feet and they are generally located away from the OHWL, precluding them from contributing shade, litter fall, and course woody debris. There is less than five percent vegetative cover below the OHWL consisting mostly of Eurasian milfoil, an exotic plant. The upland substrate consists of basalt gravels and boulders. Waterward of the OHWL the substrate consists of basalt gravels and cobbles ranging in size from 6 inches to 12 inches in diameter. The docks would be located downstream of the tailraces of Rock Island Dam and Wells Dam. These areas have a higher flow velocity and are generally more turbulent then other locations on the reservoirs, producing conditions less suitable to juvenile salmonids.

2.1.2.2.1 Factors Affecting the Species at the Population Scale

In other Opinions, NOAA Fisheries assessed life history, habitat and hydrology, hatchery influence, and population trends in analyzing the effects of the underlying action on affected species at the population scale (see, for example, FCRPS, NMFS 2000). A thumbnail description of each of these factors for each ESU covered under this consultation is provided below.

Upper Columbia River Spring Chinook

Life History. UCRS chinook are considered stream-type fish, with smolts migrating as yearlings. Most stream-type fish mature at four years of age. Few coded-wire tags are recovered in ocean fisheries, suggesting that the fish move quickly out of the north central Pacific and do not migrate along the coast.

Habitat and Hydrology. Salmon in this ESU must pass up to nine Federal and private dams, and Chief Joseph Dam prevents access to historical spawning grounds farther upstream. Degradation of remaining spawning and rearing habitat continues to be a major concern associated with urbanization, irrigation projects, and livestock grazing along riparian corridors. Overall harvest rates are low for this ESU, currently less than 10% (ODFW and WDFW 1995).

Hatchery Influence. Spring-run chinook salmon from the Carson National Fish Hatchery (a large composite, nonnative stock) were introduced into and have been released from local hatcheries (Leavenworth, Entiat, and Winthrop National Fish Hatcheries [NFH]). Little evidence suggests that these hatchery fish stray into wild areas or hybridize with naturally spawning populations. In addition to these NFH, two supplementation hatcheries are operated by the Washington State Department of Fish and Wildlife (WDFW) in this ESU. The Methow Fish Hatchery Complex (operations began in 1992) and the Rock Island Fish Hatchery Complex (operations began in 1989) were both designed to supplement naturally spawning populations on the Methow and Wenatchee rivers, respectively (Chapman *et al*. 1995).

Population Trends and Risks. For the UCRS chinook salmon ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period[3] ranges from 0.85 to 0.83, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al*. 2000). NOAA

[3]Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period that varies between spawning aggregations. Population trends are projected under the assumption that all conditions will stay the same into the future.

Fisheries has also estimated median population growth rates and the risk of absolute extinction for the three spawning populations identified by Ford *et al.* (1999), using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (*i.e.*, hatchery effectiveness = 0), the risk of absolute extinction within 100 years ranges from 0.97 for the Methow River to 1.00 for the Methow and Entiat rivers (Table B-5 in McClure *et al*. 2000). At the high end, assuming that hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of extinction within 100 years is 1.00 for all three spawning populations (Table B-6 in McClure *et al.* 2000).

NOAA Fisheries has also used population risk assessments for UCRS chinook salmon and steelhead ESUs from the draft Quantitative Analysis Report (QAR) (Cooney 2000). Risk assessments described in that report were based on Monte Carlo simulations with simple spawner/spawner models that incorporate estimated smolt carrying capacity. Population dynamics were simulated for three separate spawning populations in the UCRS chinook salmon ESU, the Wenatchee, Entiat, and Methow populations. The QAR assessments showed extinction risks for UCRS chinook salmon of 50% for the Methow, 98% for the Wenatchee, and 99% for the Entiat spawning populations. These estimates are based on the assumption that the median return rate for the 1980 brood year to the 1994 brood year series will continue into the future.

Upper Columbia River Steelhead

Life History. As in other inland ESUs (the Snake and mid-Columbia River basins), steelhead in the Upper Columbia River ESU remain in freshwater up to a year before spawning. Smolt age is dominated by two-year olds. Based on limited data, steelhead from the Wenatchee and Entiat rivers return to freshwater after one year in salt water, whereas Methow River steelhead are primarily age-2-ocean (Howell *et al*. 1985). Life history characteristics for UCR steelhead are similar to those of other inland steelhead ESUs; however, some of the oldest smolt ages for steelhead, up to seven years, are reported from this ESU. The relationship between anadromous and nonanadromous forms in the geographic area are unclear.

Habitat and Hydrology. The Chief Joseph and Grand Coulee Dam construction caused blockages of substantial habitat, as did that of smaller dams on tributary rivers. Habitat issues for this ESU relate mostly to irrigation diversions and hydroelectric dams, as well as to degraded riparian and instream habitat from urbanization and livestock grazing.

Hatchery Influence. Hatchery fish are widespread and escape to spawn naturally throughout the region. Spawning escapement is dominated by hatchery-produced fish.

Population Trends and Risks. For the UCR steelhead ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.66, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for the aggregate UCR steelhead population, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (*i.e.*, hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.25 (Table B-5 in McClure *et al.* 2000). Assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 1.00 (Table B-6 in McClure *et al*. 2000). Because of data limitations, the QAR steelhead assessments in Cooney (2000) were limited to two aggregate spawning groups- the Wenatchee/Entiat composite and the above-Wells populations. Wild production of steelhead above Wells Dam was assumed to be limited to the Methow system. Assuming a relative effectiveness of hatchery spawners of 1.0, the risk of absolute extinction within 100 years for UCR steelhead is 100%. The QAR also assumed hatchery effectiveness values of 0.25 and 0.75. A hatchery effectiveness of 0.25 resulted in projected risks of extinction of 35% for the Wenatchee/Entiat and 28% for the Methow populations. At a hatchery effectiveness of 0.75, risks of 100% were projected for both populations.

2.1.2.2.2 Factors Affecting the Species within the Action Area

Section 4(a)(1) of the ESA and NOAA Fisheries listing regulations (50 CFR 424) set forth procedures for listing species. The Secretary of Commerce must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

The proposed action includes activities that will have some level of effects with short-term impacts from category (1) in the above paragraph, and the potential for long-term impacts as described in categories (3) and (5). The characterization of these effects and a conclusion relating the effects to the continued existence of the listed salmon and steelhead that are the subject of this consultation is provided below, in Section 2.1.3.

The major factors affecting UCRS chinook and UCR steelhead within the action area include hydroelectric facility operations and maintenance and land use and shoreline development. NOAA Fisheries uses the Matrix of Pathways and Indicators (MPI) to analyze and describe the effects of these factors on listed salmon and steelhead. The MPI relates the biological requirements of listed species to a suite of habitat variables. In the analysis presented here, each factor is considered in terms of its effect on relevant pathways and associated indicators (*properly functioning, at risk, or not properly functioning*).

Hydroelectric Facilities

Hydropower development in the Columbia River has profoundly altered the riverscape of the action area, which is located within the Rocky Reach Dam pool (Lake Entiat) and Wanapum Dam pool (Lake Wanapum). These dams and other similar structures have caused a broad range of habitat degradation, and altered the structure and function of the Columbia River by converting a riverine environment to a series of reservoirs. Consequently, a host of indicators within numerous pathways of the MPI have been affected. Specifically, hydroelectric facility operations and maintenance have altered natural flow regimes, produced broad diel flow fluctuations, altered temperature profiles, inundated spawning habitat, created passage barriers, diminished sediment transport, eliminated lotic channel characteristics, altered riparian habitat, and expanded suitable habitat for piscivorous species (both native and exotic) that prey on or compete with salmonids.

Flow/Hydrology. Streamflow in the Columbia River within the action area was historically driven by natural watershed processes, but is presently more significantly controlled by the operation of mainstem dams (*i.e.*, Wells Dam and Rock Island Dam). In an unregulated condition, the Columbia River in the action area would exhibit the hydrograph of a snowmelt-dominated system where discharge peaked in the spring concurrent with melting snow, and reached baseflow during the mid- to late-summer. Under these conditions, river ecosystems experienced a range of flows that served to promote floodplain riparian ecosystems, provide habitat for aquatic species assemblages, and protect vital ecosystem linkages and channel structure (Leopold *et al.* 1964; Ward and Stanford 1995a; 1995b; Fisher *et al.* 1998). Accordingly, aquatic biota have, over the eons, evolved life-history strategies that are spatially and temporally synchronized to seasonal runoff patterns (Groot *et al*. 1995; Stanford *et al.* 1996).

Presently, however, reservoir operations within the action area have attenuated and truncated the natural runoff regime, and produced a river system that is substantially out of phase with its unregulated, natural hydrograph. Further, hydropower peaking operations often cause broad daily flow fluctuations below dam facilities. Flow regimes that deviate from the natural condition are well understood to produce a diverse array of negative ecological consequences (Hill *et al.* 1991; Ligon *et al*. 1995; Richter *et al.* 1996; Stanford *et al*. 1996). The hydrograph of the Columbia River within the action area is temporally and spatially discordant with its supporting watershed and, consequently, the aquatic and riparian biota of the system have suffered accordingly. In the MPI analysis, streamflow falls under the Flow/Hydrology pathway, and Change in Peak/Base flow indicator. Presently, for the reasons described above, this indicator is *not properly functioning*. In this instance, *not properly functioning* is defined as "pronounced changes in peak flow, base flow, and/or flow timing relative to an undisturbed watershed of similar size, geology, and geography."

Water Quality. Water quality within the action area has been degraded by hydroelectric dams that contribute to high instream temperatures, high concentrations of dissolved atmospheric gases, and high concentrations of nutrients and pollutants bound to fine sediments that settle out in reservoir pools (Spence *et al.* 1996; NMFS 2000). Portions of the action area have been placed on the Washington State 303(d) list (Clean Water Act) for degraded temperature and total dissolved gas parameters (WDOE 1996; 1998). Based on this information, NOAA Fisheries concludes that relevant water quality indicators (Temperature, Sediment/Turbidity, and Chemical Contamination/Nutrients), and thus the Water Quality pathway of the MPI are *not properly functioning*.

Habitat Access. Hydroelectric dams control river stage and flow within the action area and can inhibit safe passage of listed salmonids by creating conditions where listed salmonids may be killed or injured by mechanical impingement or high dissolved gas levels (Spence *et al*. 1996; NMFS 2000). Additionally, the dams create a false attraction to impassable areas, habitat for predators, and otherwise delay the progress of migrants. Therefore, based on the direct presence of hydroelectric dams and the secondary passage problems they cause, NOAA Fisheries concludes that the Habitat Access pathway (Physical Barriers indicator) of the MPI is *not properly functioning* within the action area because "manmade barriers present in the watershed prevent upstream and/or downstream fish passage at a range of flows."

Habitat Elements. Yet another consequence of reservoir impoundment for hydropower development is expressed as general habitat degradation within the action area. Habitat is a collective term that encompasses various physical, biological, and chemical interactions within a river and its watershed that produce the spatial and temporal environs in which riverine species exist. Numerous instream and floodplain elements of habitat (*e.g.*, substrate, large woody debris, pool frequency and quality, off-channel areas, and refugia) are vital to the production and maintenance of native fish assemblages (Everest *et al.* 1985; Bjornn and Reiser 1991; Karr 1991; Spence *et al.* 1996; NRCC 1996; NMFS 1996a).

When the Columbia River was transformed into a series of slow moving reservoirs, much of the historic habitat was inundated and most habitat functions were lost (NMFS 2000). Sediment transport has been restricted to the extent that fine materials (silt and sand) settle out of the water column in the reservoirs instead of being flushed downstream (causing sedimentation) (NMFS 1996a). In addition, low water velocity, the physical presence of the dams (both upstream and in the action area), and a management approach that maintains comparatively static reservoir pools act to trap spawning substrates, preventing downstream recruitment (NMFS 1996a). Off-channel habitat, refugia (*i.e.,* remnant habitat that buffers populations against extinction (Sedell *et al.* 1990)), and LWD production areas have been reduced or entirely eliminated by reservoir inundation. Streamflow in the action area is highly regulated between dams, and channel-forming materials and processes are greatly diminished. This wholesale simplification of habitat has reduced or eliminated pools, riffles, and other instream habitat features that are vital to the foodweb and listed salmonids (Stanford *et al.* 1996). These factors have impaired every indicator (*e.g.*, Substrate, LWD, Pool Frequency and Quality, Off-channel Habitat, and Refugia) of the Habitat Elements pathway such that all are *not properly functioning* within the action area.

Channel Condition and Dynamics. Large reservoirs are often the defining hydrologic feature in arid environments such as the action area, and their operational regimes often alter mainstem rivers both upstream and downstream of dam structures, as well as streams tributary to a reservoir pool (Collier *et al.* 1996). Reservoir structural elements and management scenarios force tributaries to equilibrate to new base levels by aggradation or incision, and these mechanisms often cascade throughout each tributary subwatershed (Lane 1955; Williams and Wolman 1984; Montgomery and Buffington 1998; Shields *et al*. 1995, 2000). Gravels trapped behind a dam are no longer available to downstream reaches for bank and bed formation/maintenance, and can limit substratum for spawning salmonids and other members of the riverine food web (Ramey *et al*. 1987; Ligon *et al.* 1995; Ward and Stanford 1995b). The availability and cycling of sediment along the river continuum has a controlling influence on channel morphology, floodplain and channel complexity, and riparian species assemblages (Leopold *et al.* 1964; Williams and Wolman 1984; Dunne and Leopold 1978; Vannote *et al*. 1980; Gregory *et al*. 1991; Ligon *et al.* 1995). In addition, altered flow regimes (from an unregulated condition) can impact hydraulic parameters with associated biological components (*i.e.*, sediment transport, gravel recruitment, and bank stability and morphology) that are important to riverine aquatic species (O'Brien 1984, Williams and Wolman 1984; Waters 1995; Ligon *et al.* 1995). Finally, periodic flooding redeposits silts, provides passage for biota to and from floodplain habitats, leads to extensive nutrient transformations, promotes channel maintenance, facilitates floodplain storage and enhances floodplain biodiversity and production (Bayley 1991; Junk *et al*. 1989; Sedell *et al*. 1989; Power *et al*. 1995).

The Columbia River throughout the action area presently bears little resemblance to the riverine environment that existed previous to hydrosystem development. The floodplain and mainstem channel of the Columbia River is buried under many feet of reservoir water, and tributary junctions are affected by inundation and pool fluctuation as well. Thus, riverine processes and their ecological linkages important to listed salmonids and the aquatic environment such as those described in the preceding paragraph are greatly diminished if not totally absent. Consequently, all requisite indicators of the Channel Condition and Dynamics pathway (*e.g.*, Width/Depth Ratio, Streambank Condition, and Floodplain Connectivity) are *not properly functioning* in the action area; the historic channel of the Columbia River no longer exists save for short tailwater reaches below the dams.

Land Use and Shoreline Development

In the action area of this project, numerous anthropogenic features and/or activities (*e.g.,* dams, marinas, docks, residential dwellings, roads, railroads, rip-rap, and landscaping) have become permanent fixtures on the landscape and have displaced and altered native riparian habitat to some degree. Consequently, the potential for normal riparian processes (*e.g*., shading, bank stabilization, and LWD recruitment) to occur is diminished, and aquatic habitat has become simplified (Ralph *et al*. 1994; Young *et al*. 1994; Fausch *et al*. 1994; Dykaar and Wigington 2000).

Shoreline development has reduced the quality of nearshore salmonid habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials, and by further disconnecting the Columbia River from historic floodplain areas. Further, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (*i.e.*, static, slackwater pools), and are thus often replaced by nonnative, exotic species (Rood and Mahoney 1990; Scott *et al.* 1996; Rood and Mahoney 2000; Braatne and Jamieson 2001). The Watershed Conditions pathway and Riparian Reserves indicator *are not properly functioning* in the action area because "the riparian reserve system is fragmented, poorly connected, and provides inadequate protection of habitats and refugia for sensitive aquatic species (less than 70% intact)."

2.1.3 Effects of the Proposed Action

The proposed permitting of the construction of fish study docks below Wells Dam and Rock Island Dam is likely to adversely affect UCRS chinook and UCR steelhead. The portion of the Columbia River that flows through the action is a migration corridor for both adults and smolts, it may also provide juvenile rearing and adult holding habitat for UCRS chinook and UCR steelhead.

NOAA Fisheries' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02).

2.1.3.1 Direct Effects

Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated (USFWS and NMFS 1998).

2.1.3.1.1 Turbidity

The proposed action includes permitting construction in and near the water. Such construction can mobilize sediments and temporarily increase local turbidity levels in the Columbia River. In the immediate vicinity of the construction activities (several meters), the level of turbidity would likely exceed natural background levels and affect fish. The proposed action includes measures to decrease the likelihood and extent of any such affect on listed salmonids. These measures include timing restrictions and construction Best Management Practices (BMPs).

Quantifying turbidity levels, and their effect on fish species is complicated by several factors. First, turbidity from an activity will typically decrease as distance from the activity increases. How quickly turbidity levels attenuate is dependent upon the quantity of materials in suspension (*e.g.*, mass or volume), the particle size of suspended sediments, the amount and velocity of ambient water (dilution factor), and the physical/chemical properties of the sediments. Second, the impact of turbidity on fish is not only related to the turbidity levels, but also the particle size of the suspended sediments.

For salmonids, turbidity has been linked to a number of behavioral and physiological responses (*i.e.*, gill flaring, coughing, avoidance, increase in blood sugar levels) which indicate some level of stress (Bisson and Bilby 1982; Sigler *et al.* 1984; Berg and Northcote 1985; Servizi and Martens 1992). The magnitude of these stress responses are generally higher when turbidity is increased and particle size decreased (Bisson and Bilby 1982; Servizi and Martens 1987; Gregory and Northcote 1993). Although turbidity may cause stress, Gregory and Northcote

(1993) have shown that moderate levels of turbidity (35-150 nephelometric turbidity units [NTUs]) accelerate foraging rates among juvenile chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

It is expected that turbidity arising from the project will be short-lived. The project includes measures to reduce or avoid turbidity impacts. These include the use of a timing window to construct the dock when the water is at a low level thus allowing the majority of construction to occur in completely dry conditions. Furthermore, installation would occur when listed species are least likely to be present near the project site, minimizing the potential for adverse effects. Those fish that are present in the action area when the effects are manifest are likely to be able to avoid the area until the effects dissipate.

2.1.3.1.2 Lost Benthic Habitat

The footprint of the proposed action will result in the net loss of 160 square feet of benthic habitat in the Columbia River. Removal of benthic habitat can reduce invertebrate species and their habitat. Aquatic invertebrates are an important food item of juvenile salmonids. Therefore, removal of benthic habitat could reduce aquatic invertebrates, thus reducing a food source for juvenile and adult salmonids.

Benthic habitats provide forage, cover, and breeding opportunities for riverine fishes (Allan 1995; Waters 1995; Stanford *et al.* 1996). Juvenile salmonids are opportunistic predators that eat a wide variety of invertebrate species. They generally feed on drifting invertebrates in streams although they are also known to forage on epibenthic prey on the stream bottom. Aquatic invertebrates can recolonize disturbed locations quickly and adapt to new features in their environment. Therefore, given the small footprint of the lost benthic habitat relative to the total benthic habitat in the action area and the fast invertebrate recolonization rate, it is unlikely that aquatic invertebrates will be affected to an extent that affects fish.

2.1.3.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action. Indirect effects might include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or be a logical extension of the proposed action.

2.1.3.2.1 Predation

The Chelan PUD fish study dock projects add four plinths and two abutments that will add approximately 47 cubic feet of in-water structure and 1,535 square feet of over-water struture. Addition of in-water structures and decking can create beneficial structure for fish species that prey on juvenile salmonids. Therefore, predation on listed salmonids could increase as a result of the Chelan PUD fish study dock projects. As a result, the project includes measures (including grating and reflective dock components) to decrease the likelihood and extent of any such effects on listed salmonids.

Native (*e.g.*, northern pikeminnow (*Ptychocheilus oregonensis*)) and exotic (*e.g.*, smallmouth bass (*Micropterus dolomieu*), black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxis. annularis*), and yellow perch (*Perca flavescens*)) piscine predators are year-round residents of the upper Columbia River reservoirs and are also known to consume salmonids. While NOAA Fisheries is not aware of any studies which have been done to specifically determine impacts of in-water and over-water structures in the Columbia River system on listed salmonids, numerous analogous predation studies suggest that serious predation impacts from these emplacements could occur. Increased predation impacts are a function of increased predation rates on listed salmonids, as well as increased predator populations from introduced artificial habitat that imparts rearing and ambush habitat for native and exotic predator species.

Four major predatory strategies are utilized by piscivorous fish: prey pursuit, prey ambush, prey habituation to a non-aggressive illusion, or prey stalking (Hobson 1979). Ambush predation is probably the most commonly employed predation strategy. Predators lie-in-wait, then dart out at prey in an explosive rush (Gerking 1994). Oftentimes, predators use sheltered areas that provide velocity shadows to ambush prey fish in faster currents (Bell 1991). The addition of four concrete plinths and two abutments to the action area will provide a total of approximately 15 (WRIAs 40 and 47) square feet of vertical current blockage that will impart velocity shadows of unknown size that expand and contract as discharge changes. These velocity shadow areas will likely be used by resting salmonids as well as ambush predators waiting to capture them.

In addition, light plays an important role in both predation success and prey defense mechanisms. Prey species are better able to see predators under high light intensity, thus providing the prey species with a relative advantage (Hobson 1979). Petersen and Gadomski (1994) found that predator success was higher at lower light intensities. Prey fish lose their ability to school at low light intensities, making them vulnerable to predation (Petersen and Gadomski 1994). Howick and O'Brien (1983) found that under high light intensities, prey species (bluegill (*Lepomis macrochirus*)) can locate largemouth bass (*Micropterus salmoides*) before they are seen by the bass. However, under low light intensities, bass can locate the prey before they are seen. Walters *et al.* (1991) indicate that high light intensities may result in increased use of shade-producing structures by predators, while Bell (1991) states that "light and shadow paths are utilized by predators advantageously."

In-water and over-water structures create light/dark interface conditions (*i.e.,* shadows) that allow ambush predators to remain in darkened areas (barely visible to prey) and watch for prey to swim by against a bright background (high visibility). Prey species moving around structure(s) are unable to see predators in dark areas under or beside structure(s) and are more susceptible to predation. Juvenile salmonids, especially ocean type chinook (among others), may utilize backwater areas during their outmigration (Parente and Smith 1981). The presence of predators may force smaller prey fish species into less desirable habitats, disrupting foraging behavior, and depressing growth (Dunsmoor *et al.* 1991). Bevelhimer (1996), in studies on smallmouth bass, indicates that ambush cover and low light intensities create a predation advantage for predators and can also increase foraging efficiency. Ward (1992) found that stomachs of pikeminnow in developed areas of Portland Harbor contained 30% more salmonids than those in undeveloped areas, although undeveloped areas contained more pikeminnows. To minimize the light/dark interface on salmonids the Chelan PUD would utilize conservative dock design criteria. Surfacing 66% of the float and 100% of the gangway will reduce the overall light/dark interfaces that would be produced by using opaque materials. In addition, the floats and plinths would be a light grey color allowing some reflection of light, further reducing the light/dark interface. However, using conservative dock design criteria does not eliminate the light/dark interfaces it only reduces the area impacted or shaded by dock structures in an attempt to reproduce more natural light conditions.

Literature and anecdotal evidence substantiates the use of docks and other structures by juvenile predators for rearing purposes. Juvenile predators may derive a survival advantage from use of these structures by avoiding predation by their larger conspecifics (Hoff 1991; Carrasquero 2001). In addition, smallmouth bass have been observed to preferentially locate nest sites near artificial structures (Pflug and Pauley 1984; Hoff 1991). Hoff (1991) documents increases of successful smallmouth bass nests of 183% to 443% and increases in catch/effort for fingerlings of 60% to 3,840% in Wisconsin lakes after the installation of half-log structures, concluding that increasing nesting cover in lakes with low nest densities, poor quality and/or quantity of nesting cover, and low first-year recruitment rates can significantly increase recruitment. The Chelan PUD would add 1,535 square feet of over-water structure and 47 cubic feet of in-water structure. These structures may benefit predators by providing cover and nesting locations for predators . In addition, the plinths themselves could provide nesting and therefore spawning locations for predator species. By increasing the number of predators, there is the potential to increase the predation pressure on listed salmonids in the action area. To minimize the effects to listed salmonids the Chelan PUD would use conservative dock design criteria (grating and reflective materials). However, the proposed action is still likely to increase rearing and spawning habitat for predators, which may improve spawning success and lead to an overall predator population increase in the action area.

Native predators such as northern pikeminnow, and introduced predators such as smallmouth bass, black crappie, white crappie, and potentially, yellow perch (Ward *et al*. 1994; Poe *et al.* 1991; Beamesderfer and Rieman 1991; Rieman and Beamesderfer 1991; Petersen *et al*. 1990; Pflug and Pauley 1984; Collis *et al*. 1995) likely utilize habitat created by in-water and over-water structures (Ward and Nigro 1992; Pflug and Pauley 1984) such as the four plinths proposed under the action under consultation. The proposed action will add both ambush and shadow areas for piscine predators. UCRS chinook and UCR steelhead use the action area for migratory purposes, and some individuals may actually rear throughout the area. The extent of increase in predation on salmonids in the Columbia River resulting from over-water structures is not well known. Further, salmon stocks with already low abundance are susceptible to further depression by predation (Larkin 1979).

In addition to piscivorous predation, in-water structures (tops of plinths) also provide perching platforms for avian predators such as double-crested cormorants (*Phalacrocorax auritis*) (Kahler *et al*. 2000), from which they can launch feeding forays or dry plumage. Placement of plinths to support the dock structures will potentially provide some usage by cormorants. However, placement of anti-perching devices on the top of the plinths should preclude their use by any potential avian predators.

Based on the presence of salmonids and native and exotic predators in the action area, and the additional shading and vertical structure created by the installation of two new docks, it appears likely that the proposed action will contribute to increased predation rates on listed juvenile salmonids. Further, the plinths will create spawning and rearing habitats that could increase predator populations by adding approximately 47 cubic feet of in-water structure and 1,535 square feet of overwater structure. Using the best available science, it is impractical at this time to quantify the number of listed salmonids that will be lost to predation as a consequence of the proposed action. However, when added to the environmental baseline, advantageous predator habitat created by this proposed action will likely result in only a minor increase in predation rates on listed salmonids.

<u>2.1.3.2.2 Littoral Productivity</u>

Docks may have some general effects on littoral productivity. The shade that docks create can inhibit the growth of aquatic macrophytes and other plant life (*e.g.*, epibenthic algae and pelagic phytoplankton). The Chelan PUD fish study docks add approximately 1,535 square feet of over-water structure. However, the project includes measures (*i.e.*, grating and reflective dock components) to decrease the likelihood and extent of any such affects on listed salmonids.

Aquatic plant life is the foundation for most aquatic food webs and their presence or absence affects many higher trophic levels (*e.g.*, invertebrates and fishes). Autochthonous pathways are of overriding importance in the trophic support of juvenile salmonids (Murphy 1991). In large rivers, autotrophs are more abundant nearer the shore (Naiman *et al*. 1980). Consequently, the shade from docks can affect local plant/animal community structure or species diversity. At a minimum, shade from docks can affect the overall productivity of littoral environments (Kahler *et al*. 2000).

The proposed action includes measures to reduce the likelihood and extent of effects from this activity by incorporating conservative dock design criteria. Partially surfacing each float deck with grating and using reflective materials for in-water components is expected to result in more natural light conditions beneath the proposed structures than would result from using traditional materials. In addition, the Chelan PUD is proposing to plant two 600 square foot sections of riparian vegetation to partially compensate for lost productivity. Furthermore, given the small footprint of the docks relative to the total surface area of littoral habitat in the action area, it is unlikely that primary productivity will be affected to an extent that affects fish.

2.1.3.3 Population Scale Effects

As detailed in Section 2.1.2.2, NOAA Fisheries has estimated the median population growth rate (lambda) for each species affected by the fish tagging dock construction projects. Under the environmental baseline, life history diversity has been limited by the influence of hatchery fish, by physical barriers that prevent migration to historical spawning and/or rearing areas, and by water temperature barriers that influence the timing of emergence, juvenile growth rates, or the timing of upstream or downstream migration. In addition, hydropower development has profoundly altered the riverine environment and those habitats vital to the survival and recovery of the ESUs that are the subject of this consultation.

The fish tagging dock projects are expected to add temporary, construction-related effects to the existing environmental baseline. Further, NOAA Fisheries believes that long-term, minor increases in predation rates and predator populations will occur as well. However, these effects, as detailed above, are not expected to have any significance at the population level. Therefore, NOAA Fisheries believes that the proposed action does not contain measures that are likely to influence population trends of the affected ESU.

2.1.3.4 Cumulative Effects

Cumulative effects are defined as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (50 CFR 402.02). Future Federal actions that are unrelated to the proposed actions are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

In the action area for this project, agricultural activities are the main land use. Riparian buffers are not properly functioning, containing little woody vegetation. Although land use practices that would result in take of endangered species is prohibited by section 9 of the ESA, such actions do occur. NOAA Fisheries cannot conclude with certainty that any particular riparian habitat will be modified to such an extent that take will occur. Riparian habitat is essential to salmonids in providing and maintaining various stream characteristics such as; channel stabilization and morphology, leaf litter, and shade. However, given the patterns of riparian development in the action area and rapid human population growth of Chelan County (27.5% from 1990-2000, U.S. Census Bureau), it is reasonably certain that some riparian habitat will be impacted in the future by non-Federal activities.

At the project sites, most land use activities are not expected to substantially increase. Both project sites and surrounding areas are owned by the PUD and/or the Bureau of Land Management. There are no known future activities planned on these lands that would have an effect on listed salmonids.

2.1.4 Conclusion/Opinion

NOAA Fisheries has reviewed the direct, indirect, and cumulative effects of the proposed action on the above listed species and their habitat. NOAA Fisheries evaluated these effects in light of existing conditions in the action area and the measures included in the action to minimize the effects. The proposed action is likely to cause short-term adverse effects on listed salmonids by modifying habitat and construction activities. These effects are unlikely to reduce salmonid distribution, reproduction, or numbers in any meaningful way. Consequently, the proposed action is not likely to jeopardize the continued existence of listed UCRS chinook and/or UCR steelhead.

2.1.5 Reinitiation of Consultation

This concludes formal consultation for the fish study dock projects. Consultation must be reinitiated if: (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed (50 CFR 402.16). To reinitiate consultation, the COE should contact the Habitat Conservation Division (Washington Branch Office) of NOAA Fisheries. Upon reinitiation, the protection provided by this incidental take statement, section 7(o)(2), becomes invalid.

2.2 Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined as significant habitat modification or degradation that results in death or injury to listed species by "significantly impairing behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering" (50 CFR 222.102). Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the effects of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize take and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

2.2.1 Amount or Extent of Take Anticipated

As stated in Section 2.1.1, above, UCRS chinook and UCR steelhead use the action area for migratory purposes and possibly rearing. UCR steelhead are likely to be present in the action area any day of the year. UCRS chinook are likely to be present in the action area during part ofthe year such that they would likely encounter some of the effects of the proposed action. Therefore, incidental take of these listed fish is reasonably certain to occur. The proposed action includes measures to reduce the likelihood and amount of incidental take. To ensure the action agency understands these measures are mandatory, take minimization measures included as part of the proposed action are restated in the Terms and Conditions provided below.

As a general matter, take caused by the proposed action is likely in the form of harm, where habitat modifications will impair normal behavior patterns of listed salmonids. Harm is likely to result from increased predation because of the construction of new in- and over-water structures. The amount or extent of take from these causes is difficult, if not impossible to estimate. In instances where the number of individual animals to be taken cannot be reasonably estimated, NOAA Fisheries uses a surrogate approach. The surrogate should provide an obvious threshold of authorized take which, if exceeded, provides a basis for reinitiating consultation.

This Opinion analyzes the extent of effects that would result from adding approximately 47 cubic feet of in-water structure, 1,535 square feet of over-water structure, and covering about 160 square feet of benthic habitat in the action area. Despite the use of the best scientific and commercial data available, NOAA Fisheries cannot estimate the number of fish that would be injured or killed by these occurrences. Therefore, the extent of take authorized in this statement is that which would occur from the addition of 47 cubic feet of in-water structure, 1,535 square feet of additional over-water structure, and 160 square feet of decreased benthic habitat. Should any of these thresholds be exceeded during project activities, the reinitiation provisions of this Opinion apply.

2.2.2 Reasonable and Prudent Measures

The measures described below are non-discretionary. They must be implemented so that they become binding conditions in order for the exemption in section 7(a)(2) to apply. The COE has the continuing duty to regulate the activities covered in this incidental take statement. If the COE fails to adhere to the terms and conditions of the incidental take statement through enforceable terms added to the document authorizing this action, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

NOAA Fisheries believes that the following reasonable and prudent measures, along with conservation measures described by the COE, are necessary and appropriate to minimize the take of ESA-listed fish resulting from implementation of this Opinion.

1. Minimize the incidental take from boat docks and walkways/gangways by applying

methods to avoid or minimize creating predator habitat.

2. Minimize the incidental take from activities involving use of heavy equipment, vehicles, earthwork, site restoration, or that may otherwise involve in-water work or affect fish passage by applying methods to avoid or minimize disturbance to riparian and aquatic systems.

3. Minimize the incidental take from erosion control activities requiring streambank and shoreline protection by using an ecological approach to bank protection and the best available bioengineering technology.

2.2.3 Terms and Conditions

To comply with ESA section 7 and be exempt from the prohibitions of section 9 of the ESA, the COE must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These Terms and Conditions largely reflect measures described as part of the proposed action in the BE and the foregoing Opinion. NOAA Fisheries has included them here to ensure that the action agency is well aware that they are non-discretionary.

1. To implement Reasonable and Prudent Measure No. 1 (minimize predator habitat), the COE shall ensure that in addition to their proposed conditions:

    1.1 Grating will be rated at greater than 60% open space.

    1.2 White or light grey dock components will be used below the surface (flotation and plinths).

    1.3 All reflective dock components below the water surface (floats and the upper parts of the plinths) will be cleaned at least annually (prior to March 1) without chemicals, such that the components remain bright and reflective through the spring outmigration of listed salmonids.

    1.4 Grated surfaces on the docks will not be used for storage or other purposes that would reduce natural light penetration through the structure.

    1.5 The entire surface of the gangways and/or walkways will be fully grated.

    1.6 All plinths, pilings and navigational aids, such as moorings, and channel markers, will be fitted with devices to prevent perching by piscivorous bird species.

2. To Implement Reasonable and Prudent Measure No. 2 (in-water work), the COE shall ensure that:

2.1 The Contractor will develop and implement a site-specific spill prevention, containment, and control plan (SPCCP), and is responsible for containment and removal of any toxicants released. The Contractor will be monitored by the COE to ensure compliance with this SPCCP. The plan must contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.

2.1.1 Practices to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.

2.1.2 Practices to confine, remove and dispose of excess concrete, cement, and other mortars or bonding agents, including measures for washout facilities.

2.1.3 A description of any hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

2.1.4 A spill containment and control plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

2.2 All discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water) will be treated as follows:

2.2.1 Facilities must be designed, built, and maintained to collect and treat allconstruction discharge water using the best available technology applicable to site conditions. The treatment must remove debris, nutrients, sediment, petroleum hydrocarbons, metals, and other pollutants likely to be present.

2.3 Material removed during excavation will only be placed in locations where it cannot enter streams, wetlands, or other water bodies.

2.4 The following erosion and pollution control materials shall be onsite:

2.4.1 A supply of erosion control materials (*e.g.*, silt fence and straw bales) is on hand to respond to sediment emergencies. Sterile straw or hay bales will be used when available to prevent introduction of exotic plants.

2.4.2 An oil absorbing, floating boom is available on-site during all phases of construction. The boom must be of sufficient length to span the wetted channel.

2.4.3 All temporary erosion controls (*e.g.*, straw bales, silt fences) are in-place and appropriately installed downslope of project activities within the riparian area. Effective erosion control measures will be in-place at all times during the contract, and will remain and be maintained until such time that permanent erosion control measures are effective.

2.5 All exposed or disturbed areas will be stabilized to prevent erosion.

2.5.1 Areas of bare soil within 150 feet of waterways, wetlands, or other sensitive areas will be stabilized by native seeding, mulching, and placement of erosion control blankets and mats, if applicable, but within 14 days of exposure.

2.5.2 All other areas will be stabilized as quickly as reasonable, but within 14 days of exposure.

2.5.3 Seeding outside of the growing season will not be considered adequate nor permanent stabilization.

2.6 All erosion control devices will be inspected during construction to ensure that they are working adequately.

2.6.1 Erosion control devices will be inspected daily during the rainy season, weekly during the dry season.

2.6.2 If inspection shows that the erosion controls are ineffective, work crews will be mobilized immediately, during working and off-hours, to make repairs, install replacements, or install additional controls as necessary.

2.6.3 Erosion control measures will be judged ineffective when turbidity plumes are evident in waters occupied by listed salmonids during any part of the year.

2.7 Sediment will be removed from sediment controls once it has reached one-third of the exposed height of the control. Whenever straw bales are used, they will be staked and dug into the ground. Catch basins will be maintained so that sediment does not accumulate within traps or sumps.

2.8 Sediment-laden water created by construction activity will be filtered before it enters a stream or other water body. Silt fences or other detention methods will be installed as close as reasonable to outlets to reduce the amount of sediment entering aquatic systems.

2.9 Any hazardous materials spill will be reported to NOAA Fisheries.

2.9.1 In the event of a hazardous materials or petrochemical spill, immediate action shall be taken to recovery toxic materials from further impacting aquatic or riparian resources.

2.9.2 In the event of a hazardous materials or petrochemical spill, a detailed description of the quantity, type, source, reason for the spill, and actions taken to recover materials will be documented. The documentation should include photographs.

2.10 Vehicle and stationary power equipment refueling, staging, and hazardous materials.

2.10.1 Vehicle staging, cleaning, maintenance, and fuel storage must take place in a vehicle staging area placed 150 feet or more from any stream, water body, or wetland.

2.10.2 All vehicles operated within 150 feet of any stream, water body, or wetland must be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected must be repaired in the vehicle staging area before the vehicle resumes operations.

2.10.3 All equipment operated instream must be cleaned before beginning operation below the OHWL to remove all external oil, grease, dirt, and mud.

2.10.4 Stationary power equipment (*e.g.*, generators, cranes) operated within 150 feet of any stream, water body, or wetland must be diapered to prevents leaks, unless otherwise approved in writing by NOAA Fisheries.

2.10.5 No auxiliary fuel tanks will be stored within 150 feet of the OHWL.

2.11 Boundaries of the clearing limits associated with site access and construction will be flagged to prevent ground disturbance of riparian vegetation, wetlands, and their sensitive sites beyond the flagged boundary.

2.12 Boulders, rock, woody materials, and other natural construction materials used for the project must be obtained from outside of the riparian area.

2.13 All project operations, except efforts to minimize storm or high flow erosion, will cease under high flow conditions that may result in inundation of the immediate work area.

2.14 All work will be done in the work window between November 15 and March 31.

3. To implement Reasonable and Prudent Measure No. 3 (erosion control), the COE shall ensure that:

    3.1 All damaged areas will be restored to pre-work conditions. Damaged streambanks must be restored to a natural slope, pattern and profile suitable for establishment of permanent woody vegetation.

    3.2 All exposed soil surfaces, including construction access roads and associated staging areas, will be stabilized at finished grade with mulch, native herbaceous seeding, and native woody vegetation. Areas requiring revegetation must be replanted between October 15 and April 15 with a diverse assemblage of species that are native to the project area or region, including grasses, forbs, shrubs, and trees.

    3.3 No herbicide application will occur within 300 feet of any stream channel as part of this action. Mechanical removal of undesired vegetation and root nodes is permitted.

    3.4 No surface application of fertilizer will be used within 50 feet of any stream channel as part of this permitted action.

    3.5 Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

    3.6 Plantings will achieve 80% survival after one year, and 80% survival or 80% ground cover after five years (including both plantings and natural recruitment). If the success standard has not been achieved after five years, the COE will submit an alternative plan to NOAA Fisheries. The alternative plan will address temporal loss of function for the five years.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A));

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

3.2 Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Federally-managed Pacific salmon: chinook; coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

3.3 Proposed Actions

The proposed action and action area are detailed above in Section 1.2 and 1.3 of this document. The action area includes habitats that have been designated as EFH for various life-history stages of chinook and coho salmon.

3.4 Effects of Proposed Action

As described in detail in Section 2.1.3 of this document, the proposed action may result in short- and adverse effects to a variety of habitat parameters.

1. Temporary risk of contamination of waters through the accidental spill or leakage of petroleum products from heavy equipment.

2. Temporary degradation of water quality from an increase in turbidity during construction.

3.5 Conclusion

NOAA Fisheries concludes that the proposed action would adversely affect designated EFH for chinook and coho salmon.

3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. While NOAA Fisheries understands that the conservation measures described in the BE will be implemented by the COE, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. To minimize the adverse effects to designated EFH for Pacific salmon (contamination of waters and suspended sediment), NOAA Fisheries recommends that the COE implement Terms and Condition No. 2 as described in Section 2.2.3 of this document.

3.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The COE must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(k)).

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